Projectile Motion 1

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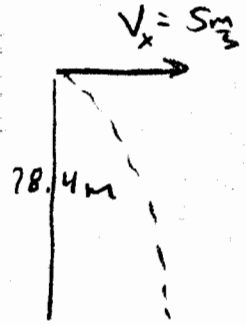


1. A stone is thrown horizontally at a speed of 5 m/s from the top of a cliff 78.4 m high.
   a. How long does it take the stone to reach the bottom of the cliff?

$y = V_{yi}t + \frac{1}{2}gt^2$

$78.4m = 0 + \frac{1}{2}\left(9.8\frac{m}{s^2}\right)t^2$ $\quad$ $t = 4s$

   b. How far from the base of the cliff does the stone strike the ground?

$x = V_x t$

$x = 5\frac{m}{s}\ 4s = 20m = 2.0 \times 10^1 m$

   c. What are the horizontal and vertical component of the velocity of the stone just before it hits the ground?

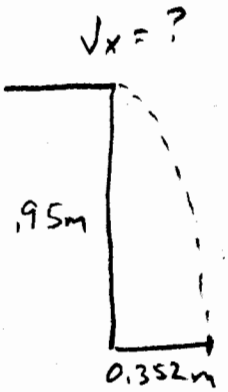
$V_x = V_{xi}$

$V_x = 5\frac{m}{s}$

$V_y = V_{yi} + at$

$= 0 + \left(9.8\frac{m}{s^2}\right)4s = 3.92 \times 10^1 \frac{m}{s}$

2. A steel ball rolls with constant velocity across a tabletop 0.95 m high. It rolls off and hits the ground 0.352 m horizontally from the edge of the table. How fast was the ball rolling?



$y = V_{yi}t + \frac{1}{2}gt^2$

$.95m = \frac{1}{2}\left(9.8\frac{m}{s^2}\right)t^2$

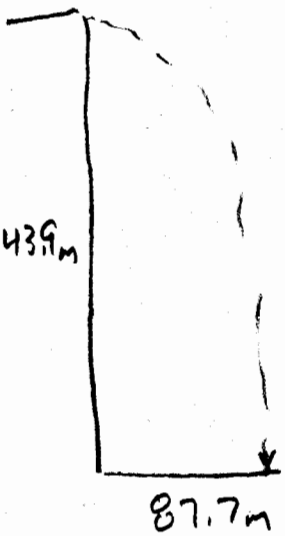
$t = 0.44s$

$x = V_x t$

$0.352m = V_x\ 0.44s$

$V_x = 8.0 \times 10^{-1} m$

3. An auto, moving too fast on a horizontal stretch of mountain road slides off the road, falling into deep snow 43.9 m below the road and 87.7 beyond the edge of the road.
   a. How long did the auto take to fall?



$y = V_{yi}t + \frac{1}{2}gt^2$

$43.9m = 0 + \frac{1}{2}\,9.8\frac{m}{s^2}t^2$ $\quad$ $t = 2.99s$

   b. How fast was it going when it left the road?

$x = V_x t$

$87.7m = V_x\ 2.99s$ $\quad$ $V_x = 2.93 \times 10^1 \frac{m}{s}$

   c. What was its acceleration 10 m below the edge of the road?

$9.8\frac{m}{s^2}$